

CLAIMS

What is claimed is:

1. A method for converting decision flowcharts into decision probabilistic graphs on
5 a data processing system comprising steps of:
receiving a representation of a decision flowchart having evidence nodes, a
root evidence node, and outcome nodes, where the outcome nodes are related to
the evidence nodes by conclusion links;
generating a probabilistic graph based on the decision flowchart, including:
10 an aggregate outcome node having a plurality of outcome states, with each
outcome state representing an outcome node of the decision flowchart;
a plurality of test nodes with each of the test nodes matching an evidence
node in the decision flowchart, and each test state matching a conclusion link
from the evidence node in the flowchart;
15 causal links between the aggregate outcome node and the evidence nodes;
calculating a set of prior probabilities for the outcome states; and
determining conditional probabilities for all test states by examining
dependencies of conclusion links on the outcome nodes in the decision flowchart.
- 20 2. A method for converting decision flowcharts into decision probabilistic graphs on
a data processing system as set forth in Claim 1, wherein the representation of the
decision flowchart is obtained as a Flowchart Markup Language (FCML)
document containing the essence of the decision flowchart.
- 25 3. A method for converting decision flowcharts into decision probabilistic graphs on
a data processing system as set forth in Claim 2, wherein the graphical
representation of the decision flowchart is a Bayesian Network (BN).

4. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 3, wherein in the step of calculating a set of conditional probabilities, a sub-step of generating a causal dependency table comprising a causal dependency of each test node on each outcome state is performed.
5. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 4, wherein the causal dependency table includes a separate column for each outcome node of the decision flowchart and a separate row for each evidence node of the decision flowchart; whereby aggregate entries of each column of the table trace a path from the root evidence node to a particular outcome node.
6. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 5, wherein the step of determining conditional probabilities further comprises a sub-step of:
generating, for each evidence node, a conditional probability table comprising the conditional probability of each test state given each outcome state.
7. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 6, further comprising a step of:
generating a model file for the probabilistic graph to an algorithmic engine for further processing.
8. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 7, wherein the predetermined likelihoods are inputted based on observed statistics.

9. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 8, comprising a further step of determining a next piece of evidence to gather based on cost-of-evidence data.
- 5 10. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 9, comprising a further step of generating a representation of the decision flowchart via graphing software for receipt in the receiving step.
- 10 11. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 10, comprising a further step of generating a user interface to accept user input to the algorithmic engine whereby the user can control the order in which evidence is collected.
- 15 12. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 11, further comprising a step of converting the graphical representation of the decision flowchart into a Bayesian network program-specific file.
- 20 13. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, wherein the graphical representation of the decision flowchart is a Bayesian Network (BN).
- 25 14. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, wherein in the step of calculating a set of conditional probabilities, a sub-step of generating a causal dependency table comprising a causal dependency of each test node on each outcome state is performed.

15. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 14, wherein the causal dependency table includes a separate column for each outcome node of the decision flowchart and a separate row for each evidence node of the decision flowchart; whereby aggregate entries of each column of the table trace a path from the root evidence node to a particular outcome node.
16. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, wherein the step of determining conditional probabilities further comprises a sub-step of:
generating, for each evidence node, a conditional probability table comprising the conditional probability of each test state given each outcome state.
17. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, further comprising a step of:
generating a model file for the probabilistic graph to an algorithmic engine for further processing.
18. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, wherein the predetermined likelihoods are inputted based on observed statistics.
19. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, comprising a further step of determining a next piece of evidence to gather based on cost-of-evidence data.
20. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, comprising a further step of

generating a representation of the decision flowchart via graphing software for receipt in the receiving step.

- 5 21. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, comprising a further step of generating a user interface to accept user input to the algorithmic engine whereby the user can control the order in which evidence is collected.
- 10 22. A method for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 1, further comprising a step of converting the graphical representation of the decision flowchart into a Bayesian network program-specific file.
- 15 23. A computer program product for converting decision flowcharts into decision probabilistic graphs, the computer program product comprising means, encoded in a computer-readable medium for:
- 20 receiving a representation of a decision flowchart having evidence nodes, a root evidence node, and outcome nodes, where the outcome nodes are related to the evidence nodes by conclusion links;
- generating a probabilistic graph based on the decision flowchart, including:
- an aggregate outcome node having a plurality of outcome states, with each outcome state representing an outcome node of the decision flowchart;
- a plurality of test nodes with each of the test nodes matching an evidence node in the decision flowchart, and each test state matching a conclusion link
- 25 from the evidence node in the flowchart;
- causal links between the aggregate outcome node and the evidence nodes;
- calculating a set of prior probabilities for the outcome states; and
- determining conditional probabilities for all test states by examining dependencies of conclusion links on the outcome nodes in the decision flowchart.

24. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, wherein the representation of the decision flowchart is obtained as a Flowchart Markup Language (FCML) document containing the essence of the decision flowchart.
25. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 24, wherein the graphical representation of the decision flowchart is a Bayesian Network (BN).
26. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 25, wherein the means for calculating a set of conditional probabilities includes means for generating a causal dependency table comprising a causal dependency of each test node on each outcome state is performed.
27. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 26, wherein the causal dependency table includes a separate column for each outcome node of the decision flowchart and a separate row for each evidence node of the decision flowchart; whereby aggregate entries of each column of the table trace a path from the root evidence node to a particular outcome node.
28. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 27, wherein the means for determining conditional probabilities further includes means for:
generating, for each evidence node, a conditional probability table comprising the conditional probability of each test state given each outcome state.

29. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 28, further comprising means for:
- 5 generating a model file for the probabilistic graph to an algorithmic engine for further processing.
30. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 29, further
- 10 comprising means for accepting predetermined likelihoods based on observed statistics.
31. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 30, further
- 15 comprising means for determining a next piece of evidence to gather based on cost-of-evidence data.
32. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 31, further
- 20 comprising means for generating a representation of the decision flowchart via graphing software for receipt by the means for receiving.
33. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 32, further
- 25 comprising means for generating a user interface to accept user input to the algorithmic engine whereby the user can control the order in which evidence is collected.

34. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 33, further comprising means for converting the graphical representation of the decision flowchart into a Bayesian network program-specific file.
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35. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, wherein the graphical representation of the decision flowchart is a Bayesian Network (BN).
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36. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, wherein the means for calculating a set of conditional probabilities further includes means for generating a causal dependency table comprising a causal dependency of each test node on each outcome state is performed.
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37. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 36, wherein the causal dependency table includes a separate column for each outcome node of the decision flowchart and a separate row for each evidence node of the decision flowchart; whereby aggregate entries of each column of the table trace a path from the root evidence node to a particular outcome node.
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38. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, wherein the means for determining conditional probabilities further comprises means for:
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- generating, for each evidence node, a conditional probability table comprising the conditional probability of each test state given each outcome state.

39. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, further comprising means for:
- 5 generating a model file for the probabilistic graph to an algorithmic engine for further processing.
40. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, further
- 10 comprising means for accepting predetermined likelihoods based on observed statistics.
41. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, further
- 15 comprising means for determining a next piece of evidence to gather based on cost-of-evidence data.
42. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, further
- 20 comprising means for generating a representation of the decision flowchart via graphing software for receipt by the means for receiving.
43. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, further
- 25 comprising means for generating a user interface to accept user input to the algorithmic engine whereby the user can control the order in which evidence is collected.

44. A computer program product for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 23, further comprising means for converting the graphical representation of the decision flowchart into a Bayesian network program-specific file.

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45. An apparatus for converting decision flowcharts into decision probabilistic graphs, the apparatus comprising a computer system including a processor, a memory coupled with the processor, an input coupled with the processor for receiving user input and data input, and an output coupled with the processor for outputting display data, wherein the computer system further comprises means, residing in its processor and memory, for:

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receiving a representation of a decision flowchart having evidence nodes, a root evidence node, and outcome nodes, where the outcome nodes are related to the evidence nodes by conclusion links;

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generating a probabilistic graph based on the decision flowchart, including:

an aggregate outcome node having a plurality of outcome states, with each outcome state representing an outcome node of the decision flowchart;

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a plurality of test nodes with each of the test nodes matching an evidence node in the decision flowchart, and each test state matching a conclusion link from the evidence node in the flowchart;

causal links between the aggregate outcome node and the evidence nodes;

calculating a set of prior probabilities for the outcome states; and

determining conditional probabilities for all test states by examining dependencies of conclusion links on the outcome nodes in the decision flowchart.

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46. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, wherein the representation of the decision flowchart is obtained as a Flowchart Markup Language (FCML) document containing the essence of the decision flowchart.

- 5 47. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 46, wherein the graphical representation of the decision flowchart is a Bayesian Network (BN).
- 10 48. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 47, wherein the means for calculating a set of conditional probabilities includes means for generating a causal dependency table comprising a causal dependency of each test node on each outcome state is performed.
- 15 49. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 48, wherein the causal dependency table includes a separate column for each outcome node of the decision flowchart and a separate row for each evidence node of the decision flowchart; whereby aggregate entries of each column of the table trace a path from the root evidence node to a particular outcome node.
- 20 50. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 49, wherein the means for determining conditional probabilities further includes means for:
generating, for each evidence node, a conditional probability table comprising the conditional probability of each test state given each outcome state.
- 25 51. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 50, further comprising means for:

generating a model file for the probabilistic graph to an algorithmic engine for further processing.

52. An apparatus for converting decision flowcharts into decision probabilistic graphs
5 on a data processing system as set forth in Claim 51, further comprising means for accepting predetermined likelihoods based on observed statistics.

53. An apparatus for converting decision flowcharts into decision probabilistic graphs
10 on a data processing system as set forth in Claim 52, further comprising means for determining a next piece of evidence to gather based on cost-of-evidence data.

54. An apparatus for converting decision flowcharts into decision probabilistic graphs
15 on a data processing system as set forth in Claim 53, further comprising means for generating a representation of the decision flowchart via graphing software for receipt by the means for receiving.

55. An apparatus for converting decision flowcharts into decision probabilistic graphs
20 on a data processing system as set forth in Claim 54, further comprising means for generating a user interface to accept user input to the algorithmic engine whereby the user can control the order in which evidence is collected.

56. An apparatus for converting decision flowcharts into decision probabilistic graphs
25 on a data processing system as set forth in Claim 55, further comprising means for converting the graphical representation of the decision flowchart into a Bayesian network program-specific file.

57. An apparatus for converting decision flowcharts into decision probabilistic graphs
on a data processing system as set forth in Claim 45, wherein the graphical representation of the decision flowchart is a Bayesian Network (BN).

58. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, wherein the means for calculating a set of conditional probabilities further includes means for generating a causal dependency table comprising a causal dependency of each test node on each outcome state is performed.
59. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 58, wherein the causal dependency table includes a separate column for each outcome node of the decision flowchart and a separate row for each evidence node of the decision flowchart; whereby aggregate entries of each column of the table trace a path from the root evidence node to a particular outcome node.
60. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, wherein the means for determining conditional probabilities further comprises means for:
generating, for each evidence node, a conditional probability table comprising the conditional probability of each test state given each outcome state.
61. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, further comprising means for:
generating a model file for the probabilistic graph to an algorithmic engine for further processing.
62. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, further comprising means for accepting predetermined likelihoods based on observed statistics.

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63. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, further comprising means for determining a next piece of evidence to gather based on cost-of-evidence data.
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64. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, further comprising means for generating a representation of the decision flowchart via graphing software for receipt by the means for receiving.
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65. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, further comprising means for generating a user interface to accept user input to the algorithmic engine whereby the user can control the order in which evidence is collected.
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66. An apparatus for converting decision flowcharts into decision probabilistic graphs on a data processing system as set forth in Claim 45, further comprising means for converting the graphical representation of the decision flowchart into a Bayesian network program-specific file.